# SOIL CONSERVATION

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*Winter feeding station for wildlife. In Coon Valley 161 such stations were established during winters of 1933–34 and 1934–35 as part of emergency wildlife conservation program of Soil Conservation Service. They were instrumental in saving pheasants and quail, pending improvement of winter food conditions in the valley.*

## PROTECTING FIN, FUR, AND FEATHER IN COON VALLEY

### By Kenneth Davis

The way is being prepared for permanent wildlife conservation in the oldest of the erosion-control demonstrational areas—Coon Valley, Wis.

Coon Valley is situated in the so-called "Driftless" or unglaciated region of southwestern Wisconsin. Ages ago when the great glacier spread over a large part of North America this region somehow escaped the ice sheet. While the hills all around were rounded off and leveled down by the grinding force of the glacier, those in what is now called Coon Valley kept their sharp ridges and steep slopes.

When the first white settlers came in 1844, the whole area was covered with alternate grasslands and woods. Small fur-bearing animals, grouse, and quail abounded. The central stream draining the area and the smaller streams pouring into it were alive with fish. But this condition did not long prevail.

The settlers cleared many acres of timber land, plowed every available acre that would yield a profit, and turned cattle to graze cut-over as well as wooded hillsides. As a result, the valley for a time was very prosperous, but it wasn't long before it became

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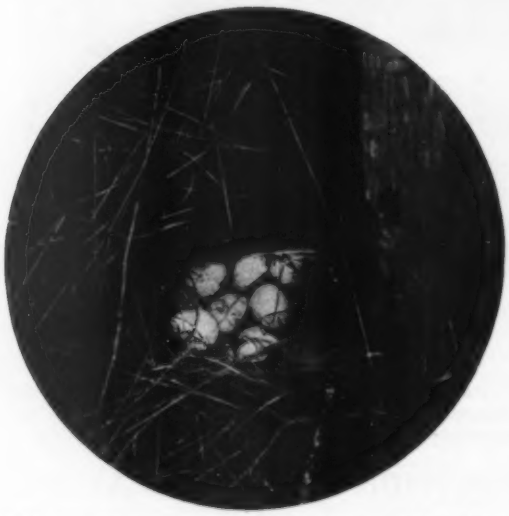
*Contour terracing and strip cropping not only provide indirect benefits to wildlife through the lessening of soil losses but also direct benefits through the establishment of what wildlife specialists term "the maximum amount of edge." Wildlife tends to congregate along the line separating one type of vegetation from another.*



*This nest of quail eggs huddled close to a fence post gives evidence of the value of allowing good cover to grow up along fence rows. In Coon Valley the practice of strictly clean farming is being modified to permit the establishing of such cover as this in odd corners.*

apparent that something was wrong. Too much steep land had been plowed and too many cattle had been turned on pastures and woodlots.

Soon decreasing crop yields gave evidence that the rich topsoil was being lost. Gullies began to cut gashes in the sloping fields. Coon Creek became muddy with silt and within a brief period of years was transformed from a narrow, deep stream to a shallow, muddy one along which floods were a seasonal occurrence. The wind-blown loess which forms a mantle over the valley is extremely erodible, and it wasn't long before Coon Valley was known as one of the most seriously eroded agricultural sections in Wisconsin.

The effects of all this on wildlife are obvious. Trout, originally abundant in Coon Creek, were almost wholly driven out by the silt and by the shallowing and consequent warming of the stream. The denuding of hillsides, the plowing of every available acre that would yield a profit in crops, the grazing of woodlands—all these meant the destruction of both food and cover for wildlife and death for large numbers of grouse, pheasants, quail, and various small animals. The populations of these birds and animals were greatly depleted.

Thus, when the erosion-control demonstration area was established in 1933, Coon Valley was well on its way toward becoming a ruined, desolate area.

## Wildlife and Erosion Control

The immediate task was to effect rather radical changes in farming methods, to coordinate these changes into a single unified program, and to keep the program economically sound.

More than 400 farmers in the watershed agreed to cooperate with the Government for a 5-year period to control erosion on their farms. They agreed to follow the farming plans which they together with erosion specialists worked out for their respective farms. In making these plans, each farm was considered as a

(*Continued on p. 112*)

*A gully before and after establishment of vegetation. Note reclamation of silt effected by wire check dams constructed by Soil Conservation Service. Permanent improvement of environment for wildlife is provided by fencing out and revegetation of gullied areas such as this.*

(*Continued from p. 110*)

unit. In no case did the Federal Government sign a cooperative agreement simply to fix a gully on a farm or to terrace a field. To get these things done, it was necessary that the farmer agree to follow recommended erosion-control practices on the farm as a whole for the 5-year period.

On these farms a concerted attack has been made on all phases of the physical problem of erosion control. Fields have been terraced, and terrace-outlet and gully-control structures have been built. Cropping systems have been rearranged to provide maximum protection to soil of various types and slopes and to maintain fertility. Strip cropping on the contour, and terracing programs, have been introduced for sloping fields. Vegetative and engineering means have been used to prevent stream-bank cutting on valuable bottom land. Denuded hillsides have been planted to trees, and existing woodlands have been fenced out to prevent grazing of them.

Obviously, this program cannot fail to benefit wildlife. In a very real sense wildlife is a product of the soil, and whatever is done to conserve the soil is of benefit to wildlife. With this in mind, the Service has made wildlife work an integral part of its program for Coon Valley. Every effort has been made to fuse the revegetative phases of erosion control with wildlife work and so achieve a coordinated program designed to conserve wildlife, as well as soil and water.

## How the Program Works

The revegetation of stream banks, gullied areas, and hillsides is not only an important part of erosion-control work but also provides a splendid opportunity for wildlife conservation. The foresters and agronomists of the Service have cooperated with the biologists by including in their plantings species having special value as wildlife food or cover.

On the edge of wooded areas having good wildlife cover, food patches consisting of various grains and sorghums are being planted each year by the cooperating farmers. At the present time there are 312 such food patches in the valley, and quail and pheasants have derived considerable benefit from them. Records kept on this work show that practically every game bird in the valley has made some use of these food patches.

Various types of food patches are being tried in the area in an effort to determine which is most satisfactory. Some of them are cultivated and some are not. They contain different species and varieties of plants. Most of the patches, however, are not experimental.

This food-patch program was supplemented, during the first 2 years of erosion-control work, by emergency winter-feeding designed to carry through the cold season many birds and small animals which otherwise would have starved to death, due to the destruction of wildlife food through agricultural operations. This was carried out by establishing feeding stations—generally barrel-feeders placed beneath a crude shelter built of boughs and brush—at strategic points throughout the valley. Some 161 of these stations were operated in the valley during the first two winters.

Last winter this supplementary feeding program was discontinued by the Service, as it was felt that winter-food conditions in the valley had been sufficiently improved to provide ample nourishment for existing populations of birds and animals. By that time, the interest of farmers in the program was assured.

## Farmer Cooperation

The wildlife and erosion-control phases of the Service have in most cases been conducted jointly. Except for some outsiders who are copying the wildlife methods, all farmers aiding in wildlife work are also cooperating in erosion-control work. Three hundred and three of the eight hundred farms in the area are now under agreement to follow recommended practices for wildlife conservation, and it is on these farms that the food patches are located.

The wildlife cooperators are developing a new concept of the relationship of wildlife to environment and are endeavoring to establish as favorable an environment for wildlife on their farms as possible. This involves a few minor changes in farming methods. For instance, one of the most serious factors affecting winter-food conditions in the valley has been the practice of clean farming. Farmers have been in the habit of removing every bit of grain from the grain fields at harvest, all corn shocks and all sorghums in the fall, and have kept their fence rows clean, removing bushes and weeds which might otherwise have served as cover for wildlife. Now, however, in consideration of the birds and small animals, they are leaving strips of corn or occasionally a series of corn shocks on areas adjacent to good cover. Fence rows are left to grow up in grass and bushes. In addition, odd corners are being planted to trees and shrubs to provide permanent cover.

Some of these farmers are also establishing winter-feeding programs of their own, placing deposits of corn

*Wildlife food patches like this one planted at the edge of good cover are established on over 300 farms in Coon Valley. Planted to corn, sorghums, and other suitable crops, they constitute an important feature of the permanent wildlife program of the Soil Conservation Service and mean the difference between life and death for many birds and animals during the long winter months.*

or grain at strategic points in the wooded portions of their farms.

One farmer in the valley, George Dingledien, stared in astonishment through the dusk of a cold winter evening last year at a covey of quail roosting in a spruce tree only a few yards from his front porch. The covey spent the nights there throughout the whole of the winter season. This same farmer fed 53 quail on his place during the winter of 1934–35 and reports a marked increase in quail and pheasant since he established a feeding program and fenced off his woodlots to exclude grazing stock.

## Extent of the Work

The Service has planted 721 acres of trees in Coon Valley and has placed 12,388 acres of woodland under protection from fire and grazing. On the 12,388 acres, the forest undergrowth, no longer annually destroyed by grazing cattle, will provide not only more effective control of run-off but also food and cover for wildlife.

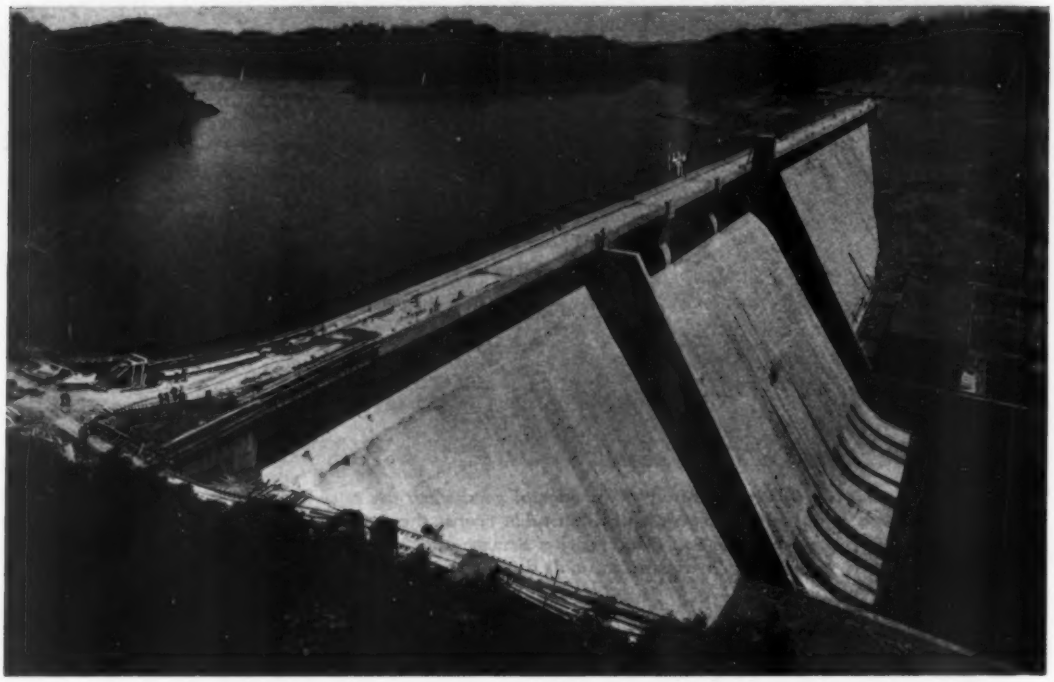
In addition to the woody plantings in woodland areas, the Service, as part of its erosion-control operations, has planted over 26 acres of trees for wildlife. All in all, 31,600 woody plants have been planted in the valley, chosen especially for their value as wildlife food or cover.

Close cooperation has been maintained with State agencies in conducting the wildlife work, and especially with Aldo Leopold, of the University of Wisconsin, who was instrumental in establishing wildlife conservation as a part of the erosion-control program. During the last 2 years, the Wisconsin Conservation Department has provided 1,000 pheasant eggs which the Soil Conservation Service used to aid in restocking the valley. The Service and the 4-H clubs in the valley area have cooperated extensively, carrying out a number of projects designed to increase population of quail, grouse, and pheasants. Cooperators are now posting their lands for regulated hunting. In this they are receiving help from the Wisconsin Conservation Department.

## Looking to the Future

In Coon Valley today, one can see the inception of a future in which the land will be treated kindly rather than as an unlimited resource to be continuously exploited. Agriculture will then be conceived as a cooperative rather than strictly competitive enterprise, in which man and nature will live in harmony rather than at odds with each other. A stable agriculture will then support a stable community. In the woods, fields, and streams, wildlife will again abound.

# T. V. A. PLANTS TREES, BUILDS CHECK DAMS, IN MOVE TO PROTECT NORRIS DAM FROM SILTING



*Norris Dam—an investment to be protected from the effects of erosion.*

Deep saw-tooth gullies in the Clinch River water shed are being paved with straw and brush, held down by wire and stakes, stabilized by black locusts and lespedeza, as a practical means to erosion control and the protection of the large Norris Dam investment.

Regional foresters and other specialists of the Soil Conservation Service, in late October, devoted two crowded days to an inspection of work being done under direction of the forestry division of the Tennessee Valley Authority. A long cavalcade of motor cars, each with a T. V. A. technician in the driver's seat, traced a serpentine course from dawn to sunset along main highways, then secondary and, finally, tertiary roads, to remote and almost inaccessible hillsides of abandoned farms and submarginal lands. Here is bad land practice. Here is erosion at its devilish worst. Here is an active threat to the permanent usefulness of Norris Dam. Here is a challenge which forestry and engineering must help to meet.

Ten principal stops were made the first day, eleven the second, and at each halting point there were snake fences to climb, barbwire to pass, rough country for the testing of high boots and corduroy. With dogwood, sourwood, tulip poplar, maple, sumac, gum and oak painting a back drop of autumnal colors, lecturers explained numerous projects involving engineering and reforestation control of gullies, and brush matting on sheet-washing areas.

At the Clinton Forest Nursery 15 million trees per year are now being produced for the planting of T. V. A. lands and for use on cooperative erosion-control projects throughout the Tennessee Valley. Still in an early stage of development, the nursery has a possible maximum production of 40 million trees. Included in the establishment is cone storage and extractory equipment designed to supply seed for both this and another forest nursery operated by T. V. A. The latter devotes itself to nursery experimentation in pollination, budding, grafting and propagation, does field testing, checks stock developed at the nursery, and conducts a system of scouting for superior native species.

*Before treatment.*

Forestry activities are conducted with an eye toward conserving not only soil but fish and wildlife as well. The Norris fish hatchery includes three hatching pools, a daphnia pool for food supply, an administration building, and pumping equipment. Fish hatched here will be placed in the 26-acre lake formed by the Doak's Creek fish dam, another point of interest on the itinerary.

The E. T. Campbell project is typical of those visited in which an effort has been made to control erosion by using check dams in only a few of the larger gullies.

(*Continued on p. 130*)

*After treatment.*

# DAYTON MEETING HEARS ENLOW ON ASIATIC PLANT-HUNTING—CONSIDERS AGRONOMIC PRACTICES

Members of the Soil Conservation Service in region 3 met in Dayton, Ohio, October 27–28, to discuss agronomic practices and farm-management problems in connection with erosion control.

At a night session Charles R. Enlow, head of the agronomy section, Washington, D. C., described his 7-months' expedition with H. L. Westover, into central Asia in search of grasses, legumes, shrubs, and trees which might prove valuable for erosion control in this country.[1] His remarks were illustrated by lantern slides.

### Searched Mountains and Deserts

Entering the central Asiatic sections through Moscow, where Russian scientists extended them every courtesy in arranging their trip, the two plant explorers searched extensively through the mountains and deserts for promising plant species. This section of central Asia grows many legumes, and other plant species which either have been adapted to conditions in the United States or give promise of being useful here. Among other valuable plant species found in central Asia are strains of Turkestan alfalfa which have proved resistant to alfalfa wilt, a disease which has become prevalent in some of the midwestern States in recent years.

Enlow and Westover brought back some 2,400 samples of seed, and since their return have received another 2,000 seed samples through arrangements made with Russian scientists. Many of these species were obtained in Turkey, the arid regions of which they also visited. These seeds have been planted in semiarid States of the Middle West. They are being tried out under varying climatic conditions from the Dakotas to Oklahoma, as well as in Arizona. In addition to the seeds of promising grasses, the plant explorers also brought back numerous species of nuts and stolons of roots of several plants which do not produce viable seed.

### Strip Widths Discussed

Among the questions discussed in the regional offices was the most desirable width of strips where strip cropping is practiced. Results from demonstrations on farms throughout the country indicate that strips should vary from 50 to 150 feet in width, Walter V. Kell, agronomist from the Washington office, said. The width varied principally with the slope, the soil type, the degree of erosion, and the rotation. Strips of 200 feet in width generally have not reduced erosion sufficiently, while strips narrower than 50 feet tend to become impractical.

Contour furrows in pastures give considerable promise of holding rain or melting snow, where it falls on the land and where it will do the most good. The Soil Conservation Service demonstrations have been under widely varying climatic, soil, and slope conditions, and in almost all instances the furrows have proved that they hold water, prevent quick run-off, and encourage absorption of moisture. Such facts have been established by measuring and comparing penetration on contoured pastures with adjacent pastures not contour-furrowed.

### Contour Furrows Considered

Arnold S. Dahl, in charge of eastern pasture work for the Washington office, reported on the effectiveness of various methods of constructing contour furrows. The demonstrations, he said, seem to indicate that shallow furrows close together give better results than deep furrows not so close together. Shallow furrows and more of them do not turn infertile subsoil to the surface and do not prevent passage of farm implements over the area, yet appear to be effective in checking water run-off, according to Mr. Enlow.

An idea of the amount of water which can be held by contour furrows may be gathered from calculations under given conditions. For example, each linear foot of contour furrow 6 inches deep and 18 inches wide will hold 0.75 cubic foot of water or 5.63 gallons. Thus, the water-holding capacity of contour furrows on a 160-acre pasture, with furrows averaging 20 feet apart, is approximately 2,500,000 gallons.

Economic phases of the soil-conservation work were given much attention in the discussions. Agricultural extension specialists of Ohio, Indiana, and Kentucky took part in the conference. E. J. Utz, head of erosion-control practices in Washington, D. C., also addressed the meeting.

"Our aim is to recommend soil-conservation methods which are within reach of every farmer", said T. C.

(*Continued on p. 130*)

[1] Mr. Enlow and Mr. Westover made this trip in 1934 as members of the Bureau of Plant Industry.

# WOODLAND, A PART OF THE FARM PLAN[1]

By John F. Preston[2]

*Excellent erosion and run-off control, plus salable products that add greatly to the value of the farmer's woodland.*

The owner of a country estate plans to use every part of his land for whatever purpose it is best adapted—agriculture, game, scenery, recreation, or for any other which promises pleasure or profit. The American farmer usually has quite a different conception. His idea of his farm consists of an aggregation of fields, pasture, and orchards. All other land included within the limits of the farm boundaries, such as woods, brush, ravines, is too often looked upon as waste land.

The farmer's conception is a natural heritage from early days, the result of the struggle of the pioneer to hew a farm out of the wilderness. The "winning of the West" was achieved by means of a march through the woods, a gradual conquest of the wooded slopes of the Appalachian Mountains for possession of the wooded areas of eastern Kentucky, Tennessee, West Virginia, and Ohio.

## The Farm Woods in Pioneer Days

In those days the only market for the products of the forest was that which supplied the farmer's domestic needs. This was appreciable, and while it did not bring in cash, was an important means of making the farm a success. From the woods the farmer secured all the material for his house, his barn, and his fences. Fuel to cook his meals, warm his house, and smoke his meat, came from his woods. The mast from the forest trees fed his hogs, and the stream which flowed through his milk house had its source in the woods higher up the slope. To find a place for his corn field and to provide pasture for his cows and horses, however, he had to cut down the forest and, oftentimes, burn the logs.

As the pioneers pushed westward, they came into a country which was not all woods, but where the forest was broken by big prairies; and still farther west the forest gave way completely to the prairie. Here the point of view of the farmer changed somewhat, and under the stimulus of various laws offering inducements for tree plantations efforts were made to grow shade trees, shelterbelts, and even plantations of trees. These first attempts at forest plantations usually failed, and in the prairie country today the general idea of the woods and ravines as the waste part of the farm still prevails.

Perhaps it was the fact that the forest openings furnished more or less forage and that the nut trees in the denser part furnished mast for the hogs which gave rise to the thought that the farm woodland was chiefly valuable as forage for stock. In any case, the chief use which most farmers have found for their woodland areas is the grazing of livestock. It is strange that this idea has grown in spite of the fact that, actually, the farm woodlands offer very little feed for cattle and horses and that the chief advantages are shade and refuge from insects.

On the other hand, as time marched on from pioneer days, some farmers realized that the woodland is a profitable part of the farm and that its use as pasture is unprofitable. There are now many isolated instances where farmers have fenced stock out of the

[1] This is the concluding article of a series.

[2] Head, Woodland Section, Soil Conservation Service.

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woods and have deliberately managed their woodlands for a timber crop. In spite of the lack of management and in spite of the abuse, the census figures show that the woodland products of the farm constitute a considerable part of the total farm revenue.

When we consider the farmer's point of view, his misuse of his woods, it is indeed remarkable that the woodlands have persisted; and the fact that they are still there is a splendid example of the recuperative ability of Mother Nature.

### Point of View Changes

More and more, however, is it becoming recognized by the farmers that not all land can be cropped and that the so-called waste land, including the woods, should be managed for whatever resource it will provide. We even find some farmers who are managing brush land for production of game, either for themselves or for purposes of leasing to hunters. The Soil Conservation Service is one of the organizations which is gradually bringing about this change in point of view. The Government's plan for control of soil erosion on the farm contemplates the use of every part of the farm, and there rarely is any waste land which cannot be brought into the scope of the plan for producing revenue or other benefits. One of the first things that is brought to the attention of the farmer is that he cannot have a forest which will continue to yield valuable returns if livestock are allowed to run under the trees. The woodland must be fenced and nature given a chance.

### Farm Plan and Woodland

Proper management of the farm woods is, therefore, a part of the farm plan as set up by the Soil Conservation Service for the control of erosion. The approach to the problem of woodland management on a farm is different when this woods must fit into the entire plan than when considered by itself and merely from the standpoint of good forestry practice. There are a number of reasons why this is true:

It is not a question of what the woods can be made to produce because of certain site and stand conditions and because certain species are present which have a particular market value; on the contrary, the woods must be managed from the point of view of what the farm as a whole can be made to produce with the woodland resource a contributing factor. In some instances the acreage of farm woodland may actually be reduced by the farm plan; and always the needs of the farmer control the character of management which the forester prescribes.

### Type of Farm an Indicator

The type of farm indicates usually the kind of forest management to be adopted. Obviously a stock farm requires more posts and corral poles, and more barns and sheds, than a grain farm. Up in the North Woods, maple sirup is an important product, and the management must provide not only the right conditions for the growth of maple trees, but there must be an abundance of fuel wood with which to fire the evaporators. Farther south, where tobacco is an important crop, flue curing requires about 2 cords of pine wood per acre of tobacco. Therefore, the number of acres of tobacco to be grown on the farm determines the minimum acreage for the piney woods if the fuel is to be obtained from the farm unit. Should there be a large percentage of the farm area in woods, the opportunity to grow timber for the general market becomes an important issue. There are other uses, also, for forests on the farm, such as picnic grounds, hunting preserves, and for purely aesthetic values. All of us have seen farms where the woods have the same artistic relation to the farm as the shrubbery to a home in the city. It forms the background which makes that farm home desirable and, therefore, has a value far beyond the products which may come from the woods. In such cases, the forest management is greatly modified over what it might be otherwise.

### Farmers' Needs Come First

In many cases, the fact that the woods provide labor for men and teams in the winter when no other work is available is sufficient reason for their maintenance and care. Even where the sale value of the products obtained covers little more than the labor cost, with no overhead for idle labor of men and horses, this becomes obviously an important matter. Management of the woodland part of the farm may be affected by this fact; and the management may be directed to produce an inferior product merely because there is a sure market for it and winter labor is the most important consideration. I know of several farmers who manage their woods with the idea of having enough lumber available in case the barn burns. This may be poor forest management, but from the standpoint of the farmer and his peculiar needs, it may be the best type of management. Here the forest provides insurance, and if the farmer prefers

*The value of the farm woods as a place of beauty and recreation is recognized not only by the family living on the farm but by the prospective purchaser if this farm should be offered for sale.*

that kind of insurance, the woodland management must be modified so as to give him just that. I remember one farm, and doubtless there are numerous other examples, where, before the farm plan was made, a forester had marked the trees for cutting from the woods from the standpoint of growing saw-logs, for which the species and the site seemed to be eminently adapted. After the farm plan was made by the Soil Conservation Service, it developed that the farmer's chief requirements were for fuel wood, and that he could better afford to go to the nearest lumber yard and buy the lumber which he occasionally needed. The management of the woodland was changed therefore to provide, not saw-logs, but fuel, which meant a short rotation instead of a long one.

These are a few of the considerations which bring about a change in the forester's point of view if he is developing a management plan for the farmer's woods as an integral part of the general farm plan developed by the Soil Conservation Service. It is radically different from the plan which is likely to be developed if other parts of the farm are not considered. If there is a new plan worked out by the agronomist which gives the farmer more pasture on 10 acres than he had before on 20, it becomes possible to retire some of the less profitable pasture lands from crop production and plant them to forest trees. Again the management of the farmer's woods is influenced by the farm plan.

The foresters in the Soil Conservation Service must be farmers as well as foresters. They must look at the farm from the farmer's point of view and make a plan for the woods only after having acquired an intimate knowledge of what the farmer needs, and after knowing what changes are being made by the agronomists and other specialists who are working on the same job. The farmer's woodland is not a separate entity but a part of the farm. It is rapidly graduating from the status of a waste area, a woods pasture—burned, abused, and neglected—to a respectable unit of the farm worthy of the same attention, the same care which the farmer gives to his corn field or his pasture land. There are values in the woods, worthy of the attention being bestowed upon them.

**VALUABLE FOR REFERENCE**

*Agricultural Statistics* 1936 may be obtained from the Superintendent of Documents, Washington, D. C., at 50 cents per copy. It constitutes a complete statistical record of the agricultural year.

# LOOKING DOWN A 5-YEAR ROAD IN SOUTHWESTERN OHIO

## By Wellington Brink

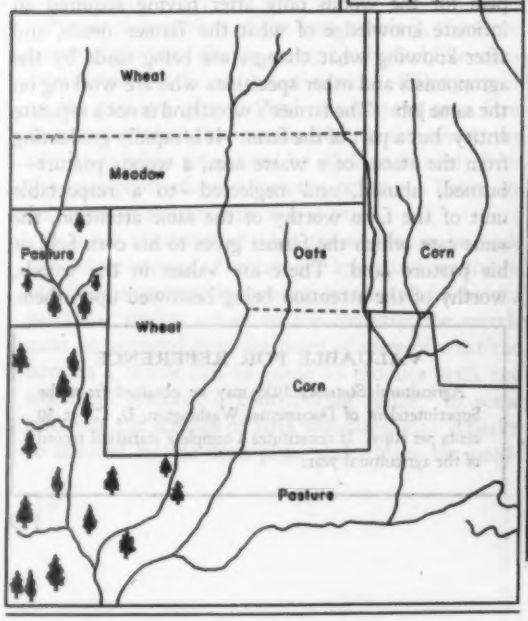
THIS, my companion told me, was the Wayne Stephenson farm. He stopped the car, put on the hand brake. I fumbled in my brief case for a land-use map I had picked up in the Hamilton office.

It had looked to me like a bit of a pipe dream, back there in the shielded office of the Indian Creek watershed project. But here was the thing in actuality, unrolling on a grander scale, not on a flat wall but on the fertile silt loam of southwestern Ohio. Yes, here it was—a good, well-managed farm in 1936, on its way toward becoming a much better-managed farm in 1940. Large rectangular fields were beginning to narrow and lengthen and curve. A fence or two had been removed, a fence or two had been constructed. Hay would be allotted more space, pasture too. Woodland's importance would be emphasized. Planning, rotating, strip cropping, terracing, fertilizing, good seed, furrowing in pastures; season by season they would be adding up to soil saved, productivity increased, and revenues enhanced by 1940.

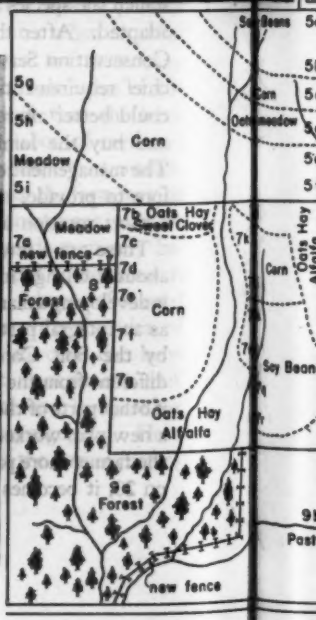
I shook the map out flat, so that I could see all three sketches together. In pink, green, blue, buff, and white it lay square, straight, and chunky in 1935. In 1936 it showed the fields beginning to assume a modern, stream-line form. In 1940 a permanent, better-balanced system was obviously in effect with grain and meadow alternating in narrow strips, shifting season by season up and down the gentle slopes.

# LAND USE MAP

*Pasture Furrows in Ohio*



*Fence Building in Ohio*



All this might still be in pipe-dream category except for its being founded on statistics and sweat, experiments and experience—and except for its finding its way from the paper in my hand to the fields by the roadside. The so-called "soil-productivity balance"[1] applicable to this farm is worth looking at.

| | Positive | Negative |
|---|---|---|
| 1935 | | |
| Productivity effect due to crops | 0.5984 | 0.8721 |
| Erosion factor | | .3891 |
| Net soil productivity balance | | .6634 |
| 1938–40 | | |
| Productivity effect due to crops | 1.2100 | .6264 |
| Erosion factor | | .2387 |
| Net soil productivity balance | .3449 | |

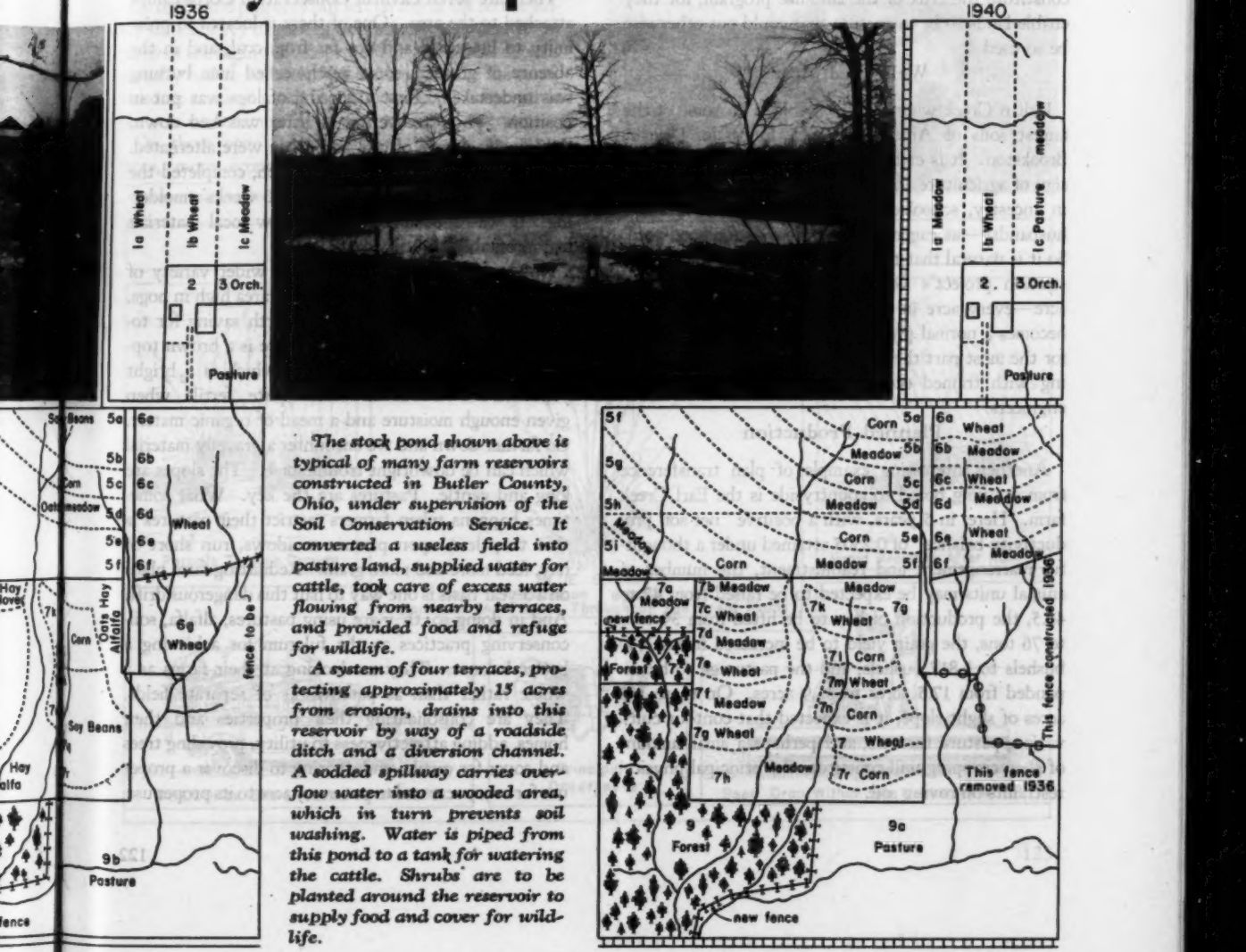
[1] A statistical yardstick explained in Bulletin 175, Agricultural Extension Service, the Ohio State University.

Erosion factors have been established by experiment for every soil type in Ohio. And it is proposed to achieve the higher "productivity effect" by stretching out the rotation period on these 171 acres, by retiring erodible land, and by introducing soil-building crops. On this place, which is at present understocked, it is not so much a matter of boosting yields as of balancing them, of assuring the safety of the farm investment, and of adding to the cash income.

### Ponds and Pastures

Fields looked greener now than in many months. Four years out of the last six have felt the heavy whip of drought. The livestock industry has suffered under

# Wayne Stephenson Farm




*The stock pond shown above is typical of many farm reservoirs constructed in Butler County, Ohio, under supervision of the Soil Conservation Service. It converted a useless field into pasture land, supplied water for cattle, took care of excess water flowing from nearby terraces, and provided food and refuge for wildlife.*

*A system of four terraces, protecting approximately 15 acres from erosion, drains into this reservoir by way of a roadside ditch and a diversion channel. A sodded spillway carries overflow water into a wooded area, which in turn prevents soil washing. Water is piped from this pond to a tank for watering the cattle. Shrubs are to be planted around the reservoir to supply food and cover for wildlife.*

its lash. Farmers sought water by drilling deep wells, and too often they found salt. They constructed shallow wells and ponds, and not infrequently their work went for naught when inexpertly built outlets gave way. A happy solution finally was reached in the cooperation of farmer and Government. Today, as we rode along the graveled side roads we stopped now and then to inspect numerous stock-watering pools built to serve the needs of both today and tomorrow. Owners or tenants had scooped the basins, thrown up the rims, implanted the fences roundabout to prevent damage by hoofs. Soil Conservation Service engineers, using W. P. A. labor, had fashioned cores and outlets. And at the troughs below, the thirsty throats of dry coming Julys and Augusts promise to find relief. Ponds such as these sometimes constitute the crux of the land-use program, for they enable lands to be in pasture that could not otherwise be so used.

### Well-Used Acres

Indian Creek watershed is bosomed on some of the fairest soils of America: Russel, Fincastle, Delmar, Brookston. It is embraced in a blended, balanced design of agriculture. Its custodians are mostly pastoral in ancestry, schooled in the arts of animal and soil husbandry—as eager for good ideas as for good seed. So it is natural that they give ready ear to the demonstration project's slogan, "A proper use for every acre—every acre in its proper use." Farm planning becomes a normal process to their orderly minds, and for the most part they are glad to profit by collaborating with trained economists, agronomists, foresters, engineers.

### Planned Production

Another interesting example of plan transference from drawing board to countryside is the Earl Creek farm. Here, in 5 years, with a positive "net soil productivity balance" of 0.2505 attained under a thoughtful rearrangement and readjustment, the number of animal units may be expected to be raised from 42 to 48.5, the production of hay to be lifted from 39 tons to 76 tons, the grain yield to be increased from 1,440 bushels to 1,817 bushels, and the pasturage to be expanded from 17.5 acres to 33.9 acres. On these 155 acres of slight slope, it is expected that contour cultivation, pasture furrows, and perhaps a small amount of strip cropping will constitute the principal physical restraints on roving soil.

Gully plugging absorbs only 10 percent of the labor expended on erosion control in this project. The usual practice is to plant trees in the gashes, protect them from livestock and fire, and let nature take its course.

Fence moving, on the other hand, is the biggest single work item. It is regarded as wisdom to lead the barriers around the slopes, put them where they will stand guard over woodland, pastures, and ponds and assist in contour-farming operations.

There had been recent rains, and water was backed up behind pasture furrows and terraces—sufficient testimony that their assigned functions were being properly fulfilled.

Stream banks, too, were seen holding at various points of stress, in gratitude toward low-cost jetties constructed by W. P. A. workers.

There are seven Civilian Conservation Corps camps attached to the area. One of these is located in proximity to limestone and not far from coal, and in the absence of grinders some much-needed lime burning was undertaken. First a flooring of logs was put in position. Then a covering of litter was laid down. And finally, layers of coal and stone were alternated. Vents for a draft, and a roof of earth, completed the kiln, and the fuel was started on its 3 weeks' smoldering. It was a demonstration of how local materials may profitably be utilized.

Nowhere, I suppose, do we find a wider variety of erosion-control measures than in this area high in hogs, low in pasture, and thoroughly worth saving for tomorrow's tomorrow. Normally there is a brown topsoil 10 to 12 inches thick, under which is a bright yellowish-brown subsoil often quite fertile when given enough moisture and a mead of organic matter. Go farther down and we encounter a gravelly material which can be downright troublesome. The slopes are long and gentle. Pastures are the key. What sometimes happens when farmers restrict their pastures is that they lean upon pasture meadows, run short of hay, feed more and more grain. Redrafting farm plans on a 5-year basis is one way to halt this dangerous drift. And in doing so, they are using pastures, alfalfa, soil-conserving practices as the fulcrum for achieving a better balance. They are looking at their farms as a whole rather than as patchworks of separate fields. They are consolidating their properties and their homes, adding attractiveness to utility, providing trees and cover for quail—endeavoring to discover a proper use for every acre and to put every acre to its proper use.

# TURNING THE EARTH UPSIDE DOWN WITH A 4-FOOT PLOW

By Walter V. Kell [1]

When a few years ago a large dam broke in Southern California, the flood waters not only wrought destruction to life and property but left on top of the fertile valley soils a heavy deposit of unproductive sediment. In many of the highly developed citrus groves this deposit actually had to be hauled off the land to save the trees. In some cases as much as 2,000 to 3,000 cubic yards per acre were removed—a very expensive operation.

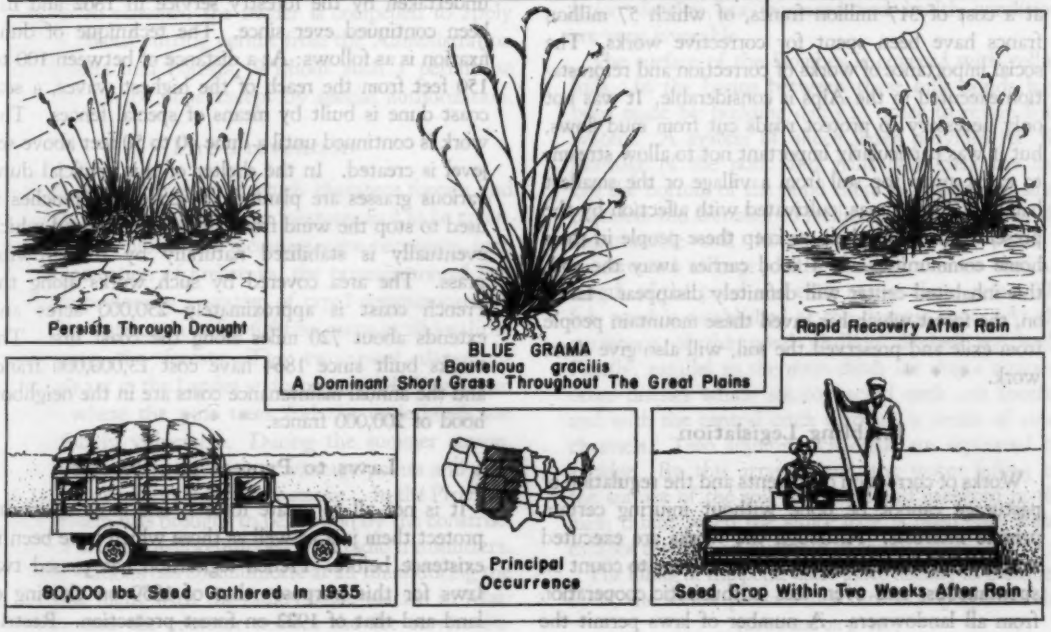
On those open valleys not yet planted to citrus trees, more economical methods were sought for restoring the fertile soil to the surface where it could be made to produce. A big 4-foot plow is today doing the job at a cost of $35 per acre. It is possible that this is the largest plow in the world. Two large caterpillar tractors are required to pull it. It turns over a 4-foot furrow.

The flood is a reminder of what might happen to these same valleys, as well as many others, if the fertile topsoil is allowed to wash from the hills until the subsoil is exposed.

Crop rotations, cover crops, contour tillage with strip cropping, and a better use of the crop residue on the bean farms, should supply safeguards.

[1] Associate head, Agronomy Section, Soil Conservation Service.

## BLUE GRAMA FOR SOIL CONSERVATION


Persists Through Drought
BLUE GRAMA
Bouteloua gracilis
A Dominant Short Grass Throughout The Great Plains
Rapid Recovery After Rain
80,000 lbs. Seed Gathered in 1935
Principal Occurrence
Seed Crop Within Two Weeks After Rain!

# CONTROL AND USE OF LITTLE WATERS IN FRANCE

## Excerpts from an address by M. Albert Magnein, Inspector General of Administration of Waters and Forests, Paris, France, Before the Upstream Engineering Conference in Washington, D. C., September 22, 1936

In the eighteenth century the river Leysse had 8 disastrous floods and in the following century, 38. The floods had, therefore, become 4.7 times more frequent. In 1738, the forest covered 13,500 acres, or 53.2 percent of the drainage basin. In 1910, the forest covered only 9,870 acres. It had lost 27 percent, or more than a quarter of its former extent. * * *

A speed at the bottom of a small stream of 10 feet per second is sufficient to erode the hardest rock, such as granite; 5 feet per second to wear down schist and conglomerate; and one-half foot per second to wear through soft clay. As man has no more influence upon the abundance of atmospheric water, storms, or melting snow than on the geological composition of the soil, he must try to reduce the velocity of the torrents. * * *

### Government Reforestation

For the entire French territory between 1861 and 1935 the French Administration of Waters and Forests has reforested approximately 1,190,000 acres at a cost of 317 million francs, of which 57 million francs have been spent for corrective works. The social importance of works of correction and reforestation executed in the Alps is considerable. It was not only necessary to protect roads cut from mud flows, but it was particularly important not to allow streams to carry away top soil from a village or the smallest hamlet. These areas, cultivated with affection by the present inhabitants help to keep these people in their home communities. If a flood carries away the soil, this inhabited center will definitely disappear. Later on, the forest which has saved these mountain people from exile and preserved the soil, will also give them work. * * *

### Enabling Legislation

Works of correction of torrents and the regulation of pasturage cannot be done without injuring certain private interests. Although the works are executed in the public interest, it would be illusory to count on spontaneous, and even less enthusiastic cooperation from all landowners. A number of laws permit the Forestry Administration to overcome resistance which might occur. The first was the law of July 28, 1860, on the reforestation of mountains; the second of June 8, 1864, on the replanting of grazing lands; and finally the law of April 4, 1862, which abrogated and replaced the two preceding laws. By virtue of the present legislation, the necessary works for the restoration of soil can be declared to be "affected with a public interest" which permits the application of eminent domain on that land where work must be done. The law of August 16, 1913, has well supplemented that of April 4, 1882, by permitting the declaration "affected with a public interest" to be applied not only for construction works against erosion but also for those aiming at the prevention of floods. * * *

### Stabilizing Sand Dunes

One must also contend with wind, which, under certain conditions, can bring about the destruction of arable soil by covering it up with sand. This happened in the Landes before works of dune fixation were undertaken by the forestry service in 1862 and has been continued ever since. The technique of dune fixation is as follows: At a distance of between 100 to 150 feet from the reach of the highest waves, a seacoast dune is built by means of special fences. The work is continued until a dune 40 to 50 feet above sea level is created. In the shelter of this artificial dune various grasses are planted. A cover of branches is used to stop the wind from displacing the sand which eventually is stabilized naturally by the growing grass. The area covered by such works along the French coast is approximately 250,000 acres and extends about 720 miles along the coast line. The works built since 1864 have cost 13,000,000 francs and the annual maintenance costs are in the neighborhood of 200,000 francs. * * *

### Laws to Protect the Forests

It is not all to create forests; one must afterward protect them just as well as those which have been in existence before. French legislation has passed two laws for this purpose—that of 1859 on clearing of land and that of 1922 on forest protection. Restric-

tive measures concerning the clearing of land date far back. An ordinance of Francis I of January 1518 and one of Henry III in 1588 prohibited cutting on royal forests and on those of others subject to certain public rights. The ordinance of 1669 reiterated this prohibition. The law of September 29, 1791, passed during the revolution, gave landowners the full freedom of their woods, but cuttings became so heavy that the Government, by the law of April 29, 1803, was forced to restrict the right of destroying forests. During the years which followed, the texts of these laws were modified and finally consolidated into the law of June 18, 1859, which is still in force. This law provides for the prohibition of clearing land whenever the forests are necessary to protect mountain soil and slopes; for the protection of the soil from the sea and the movement of sand; for the protection of land in border zones; and, for the benefit of the public health. As one may see, the scope of the law is wide and it is frequently possible to oppose the destruction of a forest by its owner.

Excessive exploitation may lead to the more or less complete disappearance of forests. The law of April 28, 1922, classifies as "protection forests" those which are considered necessary to protect mountain areas and mountain slopes from avalanches and erosion, and to prevent floods and the movement of sand. In forests so classified the owner is compelled to apply for an official cutting permit from the Administration of Waters and Forests. Without such a permit no cutting can be done except by special authorization.

## Fire Prevention

Fire is another enemy which threatens forests and against which precautionary measures had to be taken. First of all, preventive measures were necessary, such as the creation of firebreaks, the organization of fireguards possessing a system of rapid communications, and the institution of fire-fighting corps in all localities adjoining the forests. The two most dangerous regions are in the Landes and along the Mediterranean coast where the pine trees and the underbrush are particularly vulnerable. During the summer season, fire watchers are on duty at vantage points and give an alarm as soon as they notice smoke. In the Province the system was brought to perfection by the construction of watch towers equipped with radio transmitters. These stations can communicate at all times during the day and night with the radio-marine station in Marseilles, and the operator notifies the fire service immediately by telephone. A law of 1924 defines the obligations of forest owners with regard to fire fighting.

## Fish Farming

The region of Dombes forms the southern part of the district of Bresse. It is a rolling plateau and the soil is formed of a glacial clay, hardly permeable. The upper part of the soil can be more or less penetrated by cultivating machines, but beyond 20 inches the soil becomes so compact that it is difficult to dig it with a spade. Because of the profile of this region and the impermeability of the soil, the Dombes is covered with ponds which for many years have been used for the raising of fish. Previously, the region of Dombes was unhealthful because of these permanent ponds, but the situation has changed since corrective practices have been introduced. During the entire period that these lands are under water, the bottom of the pond becomes richer through deposited organic matter of animal and vegetable origin. When the pond is drained, this dung assures a fine crop of cereal plants, especially oats.

The system of fish raising and cereal farming together with the existence of a railroad for the rapid transportation of the product raised have brought to the Dombes a prosperity which is in direct contrast to its previous poverty. According to statistics, population density has increased and health conditions are very favorable.

The surface of the Dombes is covered with rolling hills. In the basins between these hills ponds have been made by building dams in order to retain flood waters. A system of sluice gates provides for the drainage of the pond and grills hold back the fish. On the bottom of the pond there is a system of small channels and trenches to facilitate the drainage of the impermeable soil. In the middle of the pond is constructed a large ditch which traverses the full length of the pond and ends at the sluice gate. The fish pond is established at the deepest spot. At the periphery of the pond girdling ditches are built. Finally, parallel to the main ditch are dug a series of other ditches which are connected with one another and with the central ditch through a series of small channels. Two adjoining channels are separated by a ridge. By this arrangement, the water falling on the surface of the soil is drained and gathered in the main ditch; when the sluice gate is open, the water escapes through an overflow channel.

The filling of the pond takes place usually in October. First, the soil is plowed in a direction perpendicular

(*Continued on p. 130*)

# SIGNIFICANCE OF NATURAL VEGETATION IN PLANNING EROSION CONTROL AND WILDLIFE MANAGEMENT[1]

By Ben Osborn and H. L. Whitaker[2]

*The vegetation of an area provides a ready appraisal of the environment. In this scene from the West Tuay Creek project, Ottawa, Kans., is shown the original boundary between a forest and a grassland type of vegetation, indicating a transition from a relatively moist to a relatively dry habitat. The grass has been almost entirely removed by overgrazing but the forest community still occupies its original position.*

What makes a plant grow, thrive, and reproduce? The factors are many, their relationships complex. Science cannot yet answer the question with completeness or certainty. Man has not yet the knowledge which would enable him to analyze the soil, the climate, and whatever else might be involved, and say definitely what species of plants will grow, or how well.

The growing plant alone is the answer to the question "Will it grow?" It is the sum total of all the plus and minus factors in its environment.[3] At a given time the plants growing upon a piece of land constitute an empirical measure of all the factors and influences which have touched their lives.

As Clements says, "the judgment of many individuals is more dependable than that of one and the verdict of many different kinds of plants grouped in a community is much better. In consequence, the study of the chief societies of a region affords the best measure of the climate and its possibilities, while the minor ones will reveal the significant variations in soil and topography."[4]

The vegetation of an area, considered as a composite, therefore, provides a ready appraisal of the environment.

When this vegetation is seen to divide itself into distinct types, and these types in turn are seen to confine themselves to different portions of the area under observation, it is plain that differences in soil, in climate, in topography, or in treatment by mankind are at work with sufficient force to affect plant growth. These differences are of the greatest importance to the agronomist, the forester, the range manager, and the wildlife technician, each of whom is concerned with growing special types of plants or managing the natural vegetation to obtain special results. The success of any of these operations depends to a large extent upon how well they are coordinated with the natural conditions under which they are practiced.

[1] This is the first of two articles on *Mapping Natural Vegetation as a Background for Erosion Control and Wildlife Management Plans.*

[2] Mr. Whitaker is regional biologist, Mr. Osborn is junior biologist, Region 7, Soil Conservation Service.

[3] Clements, F. E., 1920. Plant indicators; the relation of plant communities to process and practices. Carnegie Institution, Publication 290. Washington, D. C. 388 pages.

[4] Quoted by A. E. Rupp in "Choosing the Right Tree" in *Soil Conservation*, Sept. 1936. From News Service Bulletin, vol. III, no. 31.

Agronomists have learned to study the soil and to adapt their practices to its varying qualities. The soil is but one factor, though a most important one, in plant environment. It is as much the product of the vegetation as the vegetation is the product of it.[5] It is the result of plant life, and to a lesser extent, of animal life, working through the ages upon weathered rock materials. Its nature, therefore, varies with the type of vegetation which occupies it and has produced it. Vegetation consequently is an index to the type and quality of the soil. It may detect, and through its distribution may reveal, significant differences which remain hidden to man in his present imperfect mastery of soil science.

## Vegetation and Erosion

The value of vegetation in holding the soil where it is formed—i. e., in erosion control—is widely, though imperfectly, recognized. The practical experiments of the agricultural colleges and erosion experiment stations consistently show vegetation to be the most effective and the cheapest method of preventing erosion. Evidence of this nature is accumulating rapidly, although the surface of the subject has hardly more than been touched.

[5] Kellogg, C. E. Development and significance of the great soil groups of the United States. U. S. Dept. Agr., Misc. Pub. 229. 40 pages. 1936.

Another approach is exemplified by the laboratory experiments of Kramer and Weaver [6] on the relative efficiency of roots and tops in protecting the soil from erosion and Weaver and Harmon's [7] study on the quantity of living plant materials in prairie soils in relation to run-off and soil erosion. These studies seek to determine by controlled experimental procedure to what extent, and why, various types of vegetation protect the soil. Their findings help to explain the results of some of the more practical trials under field conditions, and lay the basis for a scientific understanding of the relation between vegetation and erosion control.

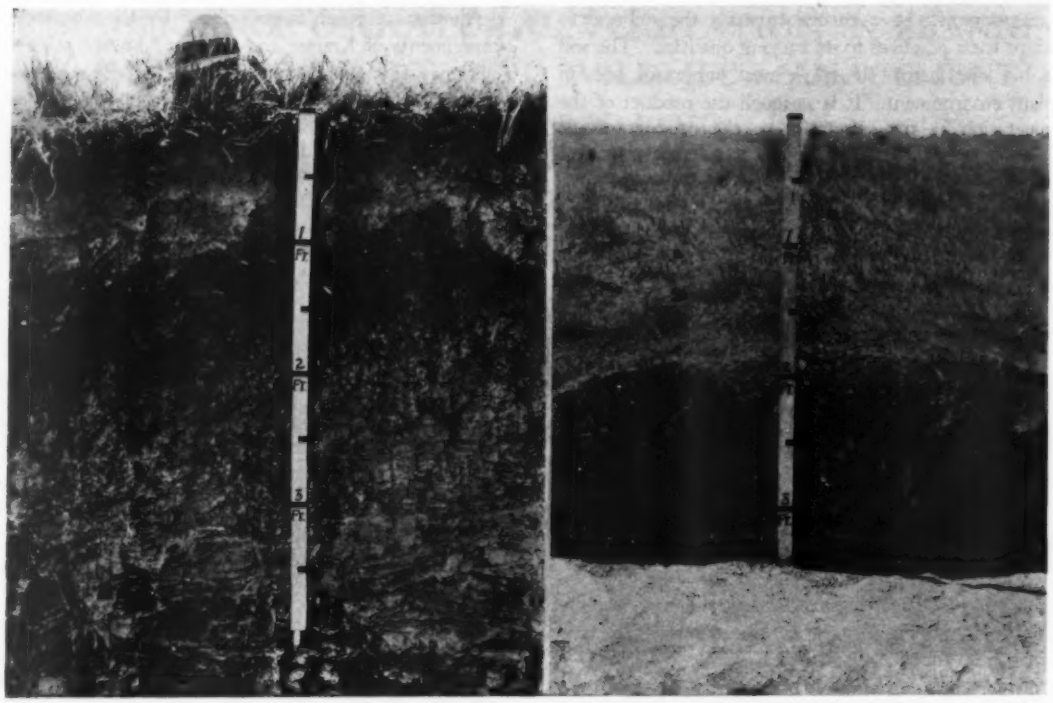
Another phase of the subject, and one which has scarcely been recognized, is the possible correlation between natural plant communities and the degree of erosion, both before and after disburbance. Booth,[8] in a study of this kind conducted as a master-of-science problem at the University of Oklahoma, found that in Cleveland County, Okla., the greatest degree of erosion had occurred in the Oak-Hickory (*Quercus-*

[6] Kramer, J., and Weaver, J. E. Relative efficiency of roots and tops of plants in protecting the soil from erosion. Nebr. Univ. Cons. Dept. Bull. 12. Lincoln, Nebr. 94 pages. 1936.

[7] Weaver, J. E., and Harmon, George W. Quantity of living plant materials in relation to run-off and soil erosion. Nebr. Univ. Cons. Dept. Bull. 8. Lincoln, Nebr. 53 pages. 1935.

[8] Booth, William E. The relation of plant communitiesto soil erosion in Cleveland County, Okla. Unpub. thesis, Department of Botany, University of Oklahoma. Norman, Okla. 1932.

***Vegetation provides the natural home for wildlife species. On the margin of a forest community is found an intermixture of trees, shrubs, and open grassland, which provides ideal environment for some game species.***



*While using natural vegetation as the indicator of environment, the ecologist must consider the changes wrought by man's disturbance. Comparison of the above soil profiles from tallgrass prairie in Oklahoma shows the removal of approximately 2 feet of topsoil since disturbance of original grassland. The measuring stick is in the same relative position in each picture.*

*Carya*) and Oak-Bluestem (*Quercus-Andropogon*) communities; while the least erosion was found in Bluestem-Dropseed (*Andropogon-Sporobolus*) communities.

## Vegetation and Wildlife

Wildlife conservation, along with soil conservation, must deal with the vegetative cover of the earth. This cover is the home of wildlife species. It is both their shelter and their food.

Each kind of animal has its own special requirements and lives in the particular type of vegetation which most nearly suits these needs. Within its range, the average population of a species rises and falls as the condition and quality of the vegetative cover does or does not favor its own particular requirements.

If man undertakes to manage and control wildlife populations, it is plain that he must work through vegetation. The plant species, either separately or in their natural associations are the materials which he must use. *These species and associations, however, cannot be shifted indiscriminately about the face of the earth. Each must be manipulated in its own natural environment.* The natural vegetative pattern, therefore, constitutes the framework for the wildlife manager's program and tells him what are the possibilities in any particular area.

## Significance of Original Vegetation

The basis of an understanding of the natural vegetation is a picture of the vegetation which occupied the area before the white man's activities so disturbed it as to initiate the processes of erosion and deplete wildlife populations.

Against this picture of original vegetation, present conditions may be viewed and interpreted. By comparing the present pattern with the original, the conservationist may see the damage to the vegetative cover that has led to soil and wildlife losses. He also may see the trends of plant succession initiated by the disturbance, and may discern potential forces of correction within the vegetative cover itself. Having inter

preted the results of man's activities to date, he then is in a position to see how even minor changes in the treatment of the natural vegetation will frequently result in material improvement in cover, to the benefit of both soil and wildlife. Likewise, he may see the weaknesses of the natural plant communities of his particular area and be better able to judge where strengthening by artificial means is necessary.

As pointed out at the beginning, an understanding of the environmental adaptations and indicator values of native species and communities provides a guide for planting practices. Not the least important, it discloses the limitations imposed by the environment upon the use of introduced or exotic vegetation in the conservation program.

In using the original vegetative pattern as an indicator of environmental conditions with which he has to work, the conservationist must not fail to consider the changes wrought by man's activities by and since the disturbance of the original cover. The topsoil of a particular site may now be partially or entirely removed, or its store of plant nutrients depleted. The minor details of topography may be modified. Surface moisture concentration and ground water table may be altered. Local atmospheric humidity may be different. But, whatever these changes in local edaphic conditions, it is certain that the climate has not been materially changed, and the same general type of vegetation which originally developed under that climate must be depended upon to provide the special combination of species which will meet the local conditions of the site. What that special combination of species may be can be determined by observing the particular variations of the climatic type which occupy similar local situations under natural conditions (not failing to recognize weed communities as a part of that type); or, possibly, only by removing all interference from natural succession and permitting the native type of vegetation to cope with the situation as only it can. If exotic species are to be used successfully, they must be species with the same environmental requirements as of the native species which otherwise would occupy the site.

Under all circumstances, it is important that the person who undertakes to manage vegetation to serve the purposes of soil conservation and wildlife production knows the type of natural vegetation which originally occupied the site. One of the first steps, therefore, in planning such a conservation program is to map and analyze the original vegetation of the area under consideration.

At least in the newer agricultural sections of the country, where relicts of the original plant communities are extant and the original pattern has not been too completely obscured by secondary succession, this is a relatively simple matter, once it is determined what types of natural vegetation originally were represented in the region and their basic ecological relationships are understood.

The methods used by the authors in a reconnaissance of the original natural vegetation of the Central Great Plains Region will be explained in another article.

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## HEDGES AND WINDBREAKS FOR SALINE LAND

Irrigated land that has a high water table is likely to suffer from alkalinity. On such lands hedges and windbreaks are important. Of the shrubs and small trees suitable for this purpose the Russian-olive (*Elaeagnus*) is one of the species that can best endure the presence of a moderate quantity of salts. Golden willow also is worthy of a test in regions having severe winters. In the Southwest, the pomegranate and species of tamarisk, decidedly salt-tolerant plants, are excellent for hedges. One species of tamarisk is hardy as far north as central-western Nevada. Some larger growing saltbushes are very tolerant of salinity and also make sturdy hedges.

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## KENYA NATIVE FARMER PROTECTS TREES

In the North Kavirondo and Kikuyu Provinces of Kenya, East Africa, the native farmer, when cultivating his land, is careful not to destroy tree vegetation. Any trees in the area are either coppiced or pollarded, this being done to ensure that the trees are not killed. After weeding the crops, the weeds are piled up around the trees, thus assisting them to recover from the removal of their tops. This must to some extent also check surface wash on the plot.

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## HALTING DRIFTING SANDS

*Diplotaxis tenuifolia*, a yellow-flowered, mustardlike Cruciferous plant, known in the pastoral districts of South Australia as Teetulpa, is being used in that country for stabilizing drift sand. This plant is considered advantageous on low-lying patches on which water accumulates and remains for a time before evaporating. Sheep will eat Teetulpa.

## CONTROL AND USE OF LITTLE WATERS IN FRANCE

(*Continued from p. 125*)

to the main ditch, the fish pond is cleaned at the same time, then the sluice gate is closed. Rain water gathers in the basin and, if rains are plentiful, 99 days will be enough to fill the pond. The depth of the ponds, therefore, is in direct relation to the hygrometric state of the atmosphere. It does not exceed 5 feet in the central part; in the fish pond it reaches about 10 feet. But the depth of the water is subject to great fluctuations and long periods of droughts constitute a great danger.

Fauna and flora of the pond are extremely rich. Fish find abundant food. One puts in mainly carp, some pike, and some perch. The ponds generally remain under water for 2 years and are cultivated in the third year. The fish are taken out at the beginning of the winter in order that the first frost may destroy the aquatic plants which form good fertilizer for the cultivated crop. If not destroyed, these aquatic plants hamper cultivation. The present surface of the ponds in the Dombes is approximately 25,000 acres.

There are in France many other regions containing a considerable number of ponds but none of them exceed the great surface of those in the Dombes. Most of these ponds were created in the Middle Ages by religious communities and by feudal seigniors, on their large estates to provide food for the great number of fast days (140 out of 365) imposed by ecclesiastical laws. At the present moment one can estimate the productive extent of lakes and ponds in France at 325,000 acres.

While surface water is frequently used for power, irrigation, and fish raising, underground water is rarely utilized directly. One such example exists in the Cran, a stony plain east of the river Arles and the Rhone. Most of the land was covered with lean pastures for cattle. The surface of this plain is separated by an impermeable layer of soil, 30 feet thick, from a heavy stream of clear water. The stream is supposed to be the old bed of the Durance which now joins the river Rhone much more to the north, at Avignon. This water is brought to the surface at certain points by drilling wells and installing pumping stations. After the land was cleared of stones and irrigated, fruit trees, grazing land, and vegetables replaced the poor grass of the former desert lands of the Cran.

## DAYTON MEETING CONSIDERS AGRONOMIC PRACTICES

(*Continued from p. 116*)

Kennard, of the regional office. "It is not sufficient that we help the farmer work out a farming program that will control soil erosion. We must go further and demonstrate that farmers can afford to follow certain methods which we ask them to adopt on the demonstration farms."

These methods include in some localities longer crop rotations, contour cultivation, strip cropping, contour furrows in pastures, woodland management and reforestation of seriously eroded areas, more legumes, encouragement of wildlife, pasture management, and the control of active washing in gullies, said Kennard.

Such methods and practices, he explained, will control sheet erosion, which is common on sloping land and which often leads to gullying. The soil conservationists determine by scientific methods which crops can be grown safely on every acre of the demonstration farm. The land then is put to such use, often requiring changes in the farmer's type of farming. These changes—whether they could and should be made, and if so, how—were questions discussed by those attending the meetings in regional headquarters.

## T. V. A. PLANTS TREES TO PROTECT NORRIS DAM

(*Continued from p. 115*)

The water from the eroding area is collected by diversion ditches and carried to the control gully in which permanent dams have been constructed. The remaining gullies have been plowed in, matted, mulched, and seeded. Seedlings planted along contour furrows in these 52 acres included 125,000 black locust; 7,800 shortleaf pine, and 17,000 black walnut.

Roadside erosion control involves matting and seeding of cut slopes, planting with vines and trees.

The Authority's comprehensive program seeks to anticipate the silting threat which has arisen in the case of other large dams, and is moving to control excessive erosion by engineering and vegetative measures on the watershed.

# BOOK REVIEWS AND ABSTRACTS

By Phoebe O'Neall Faris

## MIGRATION AND ECONOMIC OPPORTUNITY. By Carter Goodrich and Others. Philadelphia. 1936.

"If a farmer planting corn on a steep hillside in the Appalachians or plowing the windswept Great Plains is thereby wasting the Nation's soil resources, should he not be induced to move for his country's sake, even if not for his own? Or if the establishment of a family on an isolated farmstead in the Wisconsin woods is likely to cost State and county far more in school and road maintenance than the farm will ever pay in taxes, and perhaps more than it will ever produce in crops, should not such settlement be checked to reduce the burden on the taxpayer?" Herein lies the central theme in this study of the relationship between migration and economic opportunity. Where should the people be, and how should they best get there? By what ways and means may migration go forward with the least havoc in community dislocation and human uprooting?

In this report of the Study of Population Redistribution, organized in 1934 under the auspices of the Industrial Research Department of the Wharton School of Finance and Commerce of the University of Pennsylvania, the theme is developed by means of consideration of three bodies of experience: (1) The unguided migrations, since settlement of the continent, which have been characteristic of the American people; (2) certain attempts at controlled placement of population in foreign countries; and (3) recent projects of population redistribution in the United States under pressure of emergency.

In an opening discussion on regional contrasts in economic levels, an attempt is made to determine which areas have fared better than others, and to isolate for further study certain regions in which the problem of population placement is particularly acute. Outstanding regional studies included in this part of the book are the Southern Appalachian Coal Plateau, by Tryon and Allin; the Great Plains, by Thornthwaite; and the Cut-over Regions of the Great Lakes States, by Allin. These three studies might well supplement Odum's Southern Regions, a review of which was published in the August 1936 issue of SOIL CONSERVATION, in comparison of the economic status of various parts of the country in prosperity and depression. In a fourth regional study, the Old Cotton Belt, Rupert B. Vance discusses the pressure of increasing population under diminishing utilization of resources, the boll-weevil invasion, and the loss of world cotton markets.

The analysis of the Southern Appalachian Plateaus is extensive and contains considerable data concerning population surplus, the agricultural, mineral, and forest resources of the region, and survey results which point to conditions favoring further increase in manufactures for the relief of unemployment and low standards of living in the coal plateaus. As to agriculture in this region the authors state that ". . . the proportion of land with slope too steep for continuous cultivation is very high. For these reasons good farm land is scanty and most land in farms is marginal or submarginal for commercial agriculture. . . . If the depression has had any effect on the land itself, it is doubtless one of accelerating the already rapid rate of erosion. . . . In view of the topography of the region this is not at all surprising. A sample study in Knott County, Ky., 'showed that in 1930 only 15 percent of the crop land and less than 1 percent of the open pasture land had a slope of 10 percent or less. . . . Approximately 77 percent of the crop land . . . had a slope of 40 percent or more.' Such slopes cannot be plowed without serious soil wastage, and the present farm population cannot maintain even the existing low levels of living without cultivating them. Thus, a progressive lowering of living standards through soil erosion seems inevitable unless the pressure of population upon the land is relieved."

Since it is inconceivable that an increase in manufacturing can provide adequate relief of the obvious pressure of population on farm, forest, and mine, the Southern Appalachian plateaus emerge from the analysis as a region from which a spontaneous migration is to be expected and from which it should be encouraged. "The main reliance in encouraging migration must therefore be placed on facilitating the spontaneous tendency. . . . If the standards of education and transport in the mountains can be raised to the level enjoyed by the rest of the country, migration should flow with a large measure of response to economic opportunity." The authors estimate that at least 340,000 people should migrate, spontaneouly, from the Southern Appalachian coal plateaus.

In his study of the Great Plains, Dr. Thornthwaite has attacked the subject of migration from the only possible viewpoint—that of climate, soil, and vegetation. Concluding a comprehensive description of the physiography of the region, he states that "vegetation, soil, and climate combine to form a habitat which has imposed certain definite restraints on its exploitation. The area was long considered to be incapable of agricultural development. Gradually, however, farmers began to displace cattlemen, and by experimentation attempted to establish a crop system. Even after 40 years of trial, a permanently successful system has not been evolved. The misguided agricultural expansion, especially since 1920, has left a large number of families stranded." Proceeding with a history of settlement in the Great Plains, from the time of roving buffalo herds and nomadic Indians, through the Gold Rush, cattle raising, homestead legislation which encouraged the westward extension of agriculture into a region never intended for such exploitation, the dry farming period, and agricultural mechanization, with the overexpansion brought finally to a disastrous conclusion by one of the recurring periods of drought, he thus introduces his intensive analysis of the climates of the region.

A new map series by Dr. Thornthwaite shows the climates of the Great Plains throughout the period 1910–34, the climatic years and climatic gradients. In explanation of these maps he states that "the moisture types shift in an unpredictable manner with no recognizable pattern of change. Although it is impossible at present to forecast the moisture conditions a season in advance, methods analogous to those of the actuary make it possible to estimate the probability of recurrence of given climatic conditions." Thus, these maps form an important basis for estimating the feasibility of continued agriculture in various parts of the region.

Dr. Thornthwaite considers further the intensity and areal extent of damage to land from wind erosion from the standpoint of average wind velocity and movement as determined in a reconnaissance survey by the Soil Conservation Service. Accompanying maps show the relationship between various degrees of wind erosion and wind velocities. "Sixty-five percent of the total area of the Great Plains has been damaged by wind erosion; 15 percent is severely damaged, and the economic value of more than 1 percent is destroyed. Including the effects of other forms of erosion, more than 98 percent of the land in the area has suffered from erosion . . . there are no other semiarid areas on the earth where so much of the surface has been denuded. . . ."

In his discussion of population prospects in the Great Plains, Dr. Thornthwaite considers ways and means—irrigation, redistribution of the land and equalization of holdings, and subsistence homesteads—for industrial development of the Great Plains as opposed to the migration of some 390,000 people. "The most rapid solution apparent", he states, "would be a gigantic land retirement program in which private lands would be returned to public ownership. These lands could then be consolidated into districts and leased under supervision for the purposes to which they are best suited, ordinarily grazing."

Bushrod W. Allin summarizes the problems of the cut-over region of the Great Lakes States as follows: "The distress of the cut-over region has been aggravated recently by depression phenomena which we may still hope are temporary. Outstanding among the temporary difficulties are (1) the acute unemployment at the mines because of reduced demand for iron and copper, and (2) the recent occupancy of poor land by thousands of depression migrants from industrial areas. More important, however, from the standpoint of long-range policies, are the problems which confronted the region before the depression and which will remain for solution after industrial recovery. Rural poverty, isolated settlement on poor land, and excessive costs of local government were characteristic of most of the area prior to 1929, while at the same time employment in mining and woodworking industries was steadily declining." As solution to the problems it is suggested that any constructive program for improvement must have as its central objective the establishment of a permanent forest-farm economy, supplemented by recreational development. To establish a balance between population and resources, it would seem from data presented that less emigration is needed in this region than in the others discussed in the book. As stated by the author "long-range migration policies for the cut-over region of the Great Lakes States concern chiefly the prevention of unwise settlement and the correction of past mistakes by a redistribution within the area of settlers already there."

In a final chapter, Toward a Migration Policy, Carter Goodrich, director of the study, considers ways and means for economic stabilization of the country as suggested by data from research, analyses of advantages and imperfections of unguided migration, and examinations of certain methods of countries abroad and at home by which attempts have been made to guide and control the placement of population. Herein he presents an argument for Federal aid for education in the less favored areas as the most important consideration in the economics of migration.

The appendix contains tabular information concerning wheat production in western Kansas, location of manufactures, and a memorandum on the selection of manufacturing areas for the housing program. Illustrations throughout.

## ENVIRONMENT AND LIFE IN THE GREAT PLAINS. By Frederic E. Clements and Ralph W. Chaney. Washington. 1936

This treatise opens with a brief discussion of Paleozoic and Mesozoic vegetational changes and proceeds to a more detailed account of earth changes during the Cenozoic era as related to the development of vegetation in the continent of North America, particularly the Great Plains region. Emphasis is placed upon climatic changes and fossil evidence of plant life as afforded by the flora of the Don beds—the basal member of the Toronto formation as exposed near Toronto in 1900 and 1907. Arriving at the period of Plains settlement by the white man, the authors launch a rather extensive discussion of transformation under cultivation. It is the story of the conquest of the grasslands, with plant species, one after the other, fading into extinction under prevalent overgrazing; with decimation of game birds and animals and resulting increase in rodents until in many localities this condition assumed the proportions of a pest; and with advance and retreat of settlement as related to loss of native cover plants and drought.

The gist of the treatise is a discussion of the problems of readjusted utilization for the Great Plains, with particular emphasis upon the climatic cycle as the master clue to the manifold interactions of environment and life, whether these take place in nature or under the direct or indirect influence of man. In this connection the authors state authoritatively that "land classification, utilization, and conservation all rest squarely upon the basic principle of cycles, and no permanent and scientific system of production is possible without taking it into full account."

In regard to the need for ecological synthesis, emphasis is placed upon the importance of a detailed survey of every farm and ranch to determine the best use of its various parts. Such detailed survey must, of necessity, demand the fitting into a unified system of crop, grass, and forest communities, and likewise the placing of emphasis where climate and soil indicate it belongs. "Fortunately", the authors state in conclusion, "times of stress provide the very pressure needed, as well as the agencies to guide the response to it, and it now seems probable that cooperation will be set forward more in the present generation than in the full century since the settlement of the West began. However desirable it may seem that this and other social functions make a natural growth, it is evident that the nation-wide experiment of having the first steps directed by the Soil Conservation Service, Forest Service, and Division of Grazing, in their various jurisdictions, promises the only adequate solution of this crucial problem in social progress. To the ecologist, who recognizes that society as a complex organism is certain to evolve in harmony with its environment, it is of critical importance that the environment be so fashioned as to call forth progress and not retrogression."



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